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**Notes:**

1. Untranslatable words are replaced with asterisks (\*\*\*\*).
2. Texts in the figures are not translated and shown as it is.

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## FULL CONTENTS

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**[Claim(s)]**

[Claim 1]A geographic information system comprising:

(a) A displaying means which displays map information.

A courtesy counter which has a data input means which inputs a display data selection signal which chooses data displayed by map data and said displaying means.

(b) A database which stores map data inputted by a data input means of said courtesy counter.

(c) A map data management tool which manages map data stored in this database, A map retrieval means which searches map data stored in said database, and reads desired data, A map Engine control section which calls and performs a required function from a function which said map engine part has based on a manipulate signal inputted from a map engine part which has a map display means which displays a map figure and map attribute data, and the (d) aforementioned courtesy counter.

[Claim 2]The geographic information system according to claim 1, wherein a data input means of said courtesy counter is provided with a means of communication which accesses a system connected to this communication network via a communication network, and makes map display data stored transmit.

[Claim 3]Claim 1, wherein map display data transmitted by said data input means is disaster prevention pertinent information, such as rainfall and a water level, and the regulation management information on a road, and the geographic information system according to claim 2.

[Claim 4]The geographic information system according to any one of claims 1 to 3, wherein a map display means of said map engine part displays said map display data inputted by said means of communication on a map read from said database.

[Claim 5]The geographic information system according to any one of claims 1 to 4, wherein said courtesy counter updates information which acquired said map display data periodically with a time interval defined beforehand, and was displayed on a map.

[Claim 6]Claim 1, wherein said map Engine control section accesses a system which starts a communications program of said data input means based on said inputted display data selection signal, and stores predetermined data and makes data acquire, and the geographic information system according to

claim 2.

[Claim 7]The geographic information system according to claim 1 summarizing said map Engine control section in a unit of the operation concerned, and providing said courtesy counter with it based on a manipulate signal into which a functional function group which said map engine part has was inputted from said courtesy counter.

[Claim 8]Claim 1, wherein said map Engine control section and said courtesy counter interface using conditions defined general-purpose, and the geographic information system according to claim 7.

[Claim 9]The geographic information system according to claim 1 a map data management tool of said map engine part forming a layer which stores predetermined map data, and group-izing two or more layers, storing them in a folder, creating a tree hierarchy structure of a folder, and performing hierarchy management.

[Claim 10][ a map retrieval means of said map engine part ] [ map graphic data stored in said database by a map attribute item inputted from said courtesy counter ] Or the geographic information system according to claim 1 searching said map display data stored in said database by range specification on the map concerned, and layer specification.

[Claim 11]The geographic information system according to claim 1, wherein said database consists of a database which stores map position data, and a database which stores map attribute data.

[Claim 12]A software configuration method of a geographic information system characterized by comprising the following.

A function which displays map information.

A service program which has the function to input a signal which chooses map data and data to display.

A map engine control program which performs a function which said map engine has based on a manipulate signal inputted via said service log rum.

A function to manage map information which consists of map position data stored in said database, and map attribute data, A function which searches map data stored in said database based on a search condition inputted from said map engine control program, and reads desired data, A map engine which has a function which displays a map figure and map attribute data based on a map display signal inputted from said map engine control program.

[Claim 13]A function which said map engine packed by said map engine control program for every operation input has is used for said service program, A software configuration method of the geographic information system according to claim 12 being the program which realizes a predetermined function, and which was described by a general-purpose language.

[Claim 14]A software configuration method of the geographic information system according to claim 12, wherein said service program has a program which performs processing which accesses a system connected to connection processing with a communication network, and this communication network, and acquires map display data.

[Claim 15]A function which displays map information, and a function to input a control signal which controls map data and said display, A service program which has a communication function which acquires map

display data via a communication network, A map engine control program for performing a function which said map engine has based on a manipulate signal supplied from said service program, A function to manage map information which consists of map position data stored in said database, and map attribute data, A function which searches map data stored in said database based on a search condition inputted from said map engine control program, and reads desired data, A recording medium which recorded a map engine which has a function which displays a map figure and map attribute data based on a map display signal inputted from said map engine control program and in which computer reading is possible.

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#### [Detailed Description of the Invention]

##### [0001]

[Field of the Invention]This invention is used for the geographic information systems for disaster prevention etc., unifies suitable map information, a weather bulletin, etc., and relates to the recording medium which recorded the software configuration method of a geographic information system and a geographic information system and program which display necessary data on a map.

##### [0002]

[Description of the Prior Art]The geographic information system (Geographic InformationSystems:GIS) which displays various information on a map came to be used for land development, disaster prevention planning, etc., and has expanded the use. Conventionally, since the geographic information system needed considerable time and labor for database creation of a map, the user was restricted. Therefore, emphasis was put on development of the system which was set by each user's use rather than flexibility and which is the easiest to use when developing a geographic information system. However, the use is spreading conjointly with a substantial map data base and the improvement in performance of a computer, and developing efficiently the geographic information system united with various users' demand with expansion of a use is called for in recent years.

[0003]Drawing 5 is a figure showing the software configuration of the conventional geographic information system 50. The courtesy counter 51 consists of a program which has an interface function corresponding to the function and user who process the signal of operations, such as an input of map data, presenting of map information, and selection of display data, in the figure. The map engine part 52 is a program which has the function to consist of some functional function groups and to process management of map data, search of map data, the display of a map figure, etc. The database 53 stores map position data required for the display of a map, map attribute data, and operating data required for service to a user.

[0004]Generally, the thing peculiar to the geographic information system 50 is set that the conditions of the interface of the courtesy counter 51 and the map engine part 52 are most suitable for employment of a system. Therefore, two programs are related closely, when changing the function and user interface of the geographic information system 50 according to the service which a new user demands, the courtesy counter 51 and the map engine part 52 are united, and a change of a design is made.

##### [0005]

[Problem to be solved by the invention] In the conventional geographic information system mentioned above, since it could not but develop by 1 software maker even when the relation between a courtesy counter and a map engine part is dense, it is difficult to separate a function and a geographic information system is big, there was a problem that a development period became long. Since the function of a courtesy counter and a map engine part was related closely, the engineer who has both technical knowledge was needed for development of a system, and there was a problem that an engineer's reservation was difficult in it. In order for the software maker who can develop both a courtesy counter and a map engine part to provide a required function according to different demand service for every that competition in a market is not expectable since it is restricted, or user, Not only the program of a user interface but change of a map engine was needed, and there was a problem that development cost became high.

[0006] This invention was made in view of the above-mentioned point, and, [ that purpose ] [ only by developing a courtesy counter by separating the function of a courtesy counter and a map engine part, and setting up the conditions of a still more nearly general-purpose interface ] It is in providing the recording medium which recorded the software configuration method of a geographic information system and a geographic information system which can satisfy various users' demand without changing a map engine part, and its program.

[0007]

[Means for solving problem] In order to solve above-mentioned SUBJECT, [ the invention according to claim 1 ] The courtesy counter which has a displaying means which displays map information, and a data input means which inputs the display data selection signal which chooses the data displayed by map data and said displaying means, The database which stores the map data inputted by the data input means of said courtesy counter, The map data management tool which manages the map data stored in this database, The map retrieval means which searches the map data stored in said database, and reads desired data, Based on the manipulate signal inputted from the map engine part which has a map display means which displays a map figure and map attribute data, and said courtesy counter, the map Engine control section which calls and performs a required function from the function which said map engine part has is provided.

[0008] In the geographic information system according to claim 1, the invention according to claim 2, [ a data input means of said courtesy counter ] It has a means of communication which accesses a system connected to this communication network via a communication network, and makes map display data stored transmit.

[0009] Map display data to which the invention according to claim 3 is transmitted by said data input means in Claim 1 and the geographic information system according to claim 2 is characterized by being disaster prevention pertinent information, such as rainfall and a water level, the regulation management information on a road, etc.

[0010] The invention according to claim 4 displays a map display means of said map engine part in the geographic information system according to any one of claims 1 to 3 on a map which read said map display data inputted by said means of communication from said database.

[0011] The invention according to claim 5 updates information which said courtesy counter acquired said map display data periodically with a time interval defined beforehand, and was displayed on a map in the

geographic information system according to any one of claims 1 to 4.

[0012]In Claim 1 and the geographic information system according to claim 2, the invention according to claim 6, [ said map Engine control section ] The system which starts the communications program of said data input means based on said inputted display data selection signal, and stores predetermined data is accessed, and data is made to acquire.

[0013]In the geographic information system according to claim 1, based on the manipulate signal into which the functional function group which said map engine part has was inputted from said courtesy counter, the invention according to claim 7 is summarized in the unit of the operation concerned, and provides said courtesy counter with said map Engine control section.

[0014]The invention according to claim 8 interfaces using the conditions as which said map Engine control section and said courtesy counter were determined general-purpose in Claim 1 and the geographic information system according to claim 7.

[0015]In the geographic information system according to claim 1, the invention according to claim 9, [ the map data management tool of said map engine part ] The layer which stores predetermined map data is formed, and two or more layers are group-sized, it stores in a folder, the tree hierarchy structure of a folder is created, and hierarchy management is performed.

[0016]In the geographic information system according to claim 1, the invention according to claim 10, [ a map retrieval means of said map engine part ] Map graphic data stored in said database by a map attribute item inputted from said courtesy counter or said map display data stored in said database by range specification on the map concerned and layer specification is searched.

[0017]In the invention according to claim 11, said database consists of a database which stores map position data, and a database which stores map attribute data in the geographic information system according to claim 1.

[0018]A service program which has a function the invention according to claim 12 of displays map information, and the function to input a signal which chooses map data and data to display, A map engine control program which performs a function which said map engine has based on a manipulate signal inputted via said service log rum, A function to manage map information which consists of map position data stored in said database, and map attribute data, A function which searches map data stored in said database based on a search condition inputted from said map engine control program, and reads desired data, A map engine which has a function which displays a map figure and map attribute data based on a map display signal inputted from said map engine control program is provided.

[0019]In the software configuration method of the geographic information system according to claim 12, the invention according to claim 13, [ said service program ] It is characterized by being the program which realizes a predetermined function using the function which said map engine packed for every operation input has by said map engine control program and which was described by the general-purpose language.

[0020]In the software configuration method of the geographic information system according to claim 12, [ the invention according to claim 14 ] Said service program has a program which performs processing which accesses the system connected to connection processing with a communication network, and this communication network, and acquires map display data.

[0021]The function for which the invention according to claim 15 displays map information and the function to input the control signal which controls map data and said display, A service program which has a communication function which acquires map display data via a communication network, A map engine control program for performing the function which said map engine has based on the manipulate signal supplied from said service log rum, The function to manage the map information which consists of map position data stored in said database, and map attribute data, The function which searches the map data stored in said database based on the search condition inputted from said map engine control program, and reads desired data, It is the recording medium which recorded the map engine which has a function which displays a map figure and map attribute data based on the map display signal inputted from said map engine control program and in which computer reading is possible.

[0022]

[Mode for carrying out the invention]Hereafter, the 1 embodiment of this invention is described with reference to Drawings. In the following explanation, it explains taking the case of the case where a geographic information system creates map information using a weather bulletin, disaster prevention information, etc. Drawing 1 is a figure showing the software configuration of the geographic information system 10 by the embodiment. This software is mounted in the hardware (illustration abbreviation) which consists of CPU (central processing unit), a memory, peripheral equipment, etc., and that function is realized. Display devices, such as input devices, such as a keyboard and a mouse, CRT (Cathode Ray Tube), a liquid crystal display, an external storage, etc. are connected as peripheral equipment.

[0023]In drawing 1, 11 is a functional group which realizes service by a user's demand, and is a courtesy counter which consists of a program described by program language, for example, the C language, a C++ language, etc. The courtesy counter 11 consists of a program according to service function which performs signal processing of the input process of map data, presenting of the map information by a display device, and selection operation of display data, etc. It has a communication function, a communications program is started based on the signal inputted from the input device, and a weather bulletin, observation office position information, etc. are acquired from the other systems 20 via the communication network 30.

[0024]14 in drawing 1 is a database which consists of the database 15c which stores the database 15a which stores map position data, the database 15b which stores the map attribute data related to a map figure, and data required for general business. Map position data is divided and stored in two or more layers, such as geographical feature, a traffic information, and river information, so that data can be chosen according to the purpose to display. Map attribute data sets up conditions when displaying the data of these layers, and is set up and stored for every layer. The data stored in the database 15c is data which is not related to mapping, direct access is carried out from the courtesy counter 11, without passing map Engine control section 12, and record and read-out are performed.

[0025]12 is a map Engine control section which takes out and summarizes a required functional function group from the map engine part 13 for every operation of the courtesy counter 11, and is provided to the courtesy counter 11. The interface conditions of the courtesy counter 11 and map Engine control section 12 give flexibility, and they are set up so that the function by the side of the courtesy counter 11 and map Engine control section 12 can be separated. The engine control function which constitutes map Engine

control section 12 corresponds to the operation from the courtesy counter 11, calls the predetermined map functional function group of the map engine part 13 according to operation, and realizes one map function. [0026]13 in drawing 1 is a map engine part, and consists of a function group for realizing some functions. Hereafter, a map display function, a map data controlling function, a map search service, etc. which are the main functions of the map engine part 13 are explained in detail. A map display function is a function which reads map data from the database 14 based on the display requirement from map Engine control section 12, and displays a map on the screen of a display device. When there are directions of printing of map data, data is outputted to a printer or a plotter. It asks for \*\*\*\*\* of the layer information displayed from a display requirement and the position to display, and the range first, and the display of a map is performed by reading map data from the database 14 based on the information.

[0027]The map displayed is a detailed map of the layout map of the plan citation which shows the range to display on a map by bigger scale or the specified position, and the range. When the layout map is being opened, the range currently displayed with the detailed map is shown on a layout map. On a background map figure, the weather bulletin inputted via the courtesy counter 11 piles up a layer, and are displayed. Based on selection of a screen display rectangle, a square area designated range, etc., data is outputted to a printer or a plotter.

[0028]A map display function has a screen-scrolling function and map expansion / reduction function. In a screen-scrolling function, a function to which a map on a screen is moved freely is realized by clicking with a mouse. When a layout map is displayed, by moving a display rectangle of a detailed map on a layout map, a map currently displayed on detailed map Drawings also interlocks, and renewal of a display is carried out. If it scrolls on a detailed map, a display rectangle of a detailed map shown on a layout map will interlock and move.

[0029]In management of map data, in order to manage inputted map data, it has a layer controlling function. Drawing 2 is a figure showing a concept of layer management. Information showing a cities, towns and villages administration community, a traffic information of a road regulation managerial system, river information, rainfall, water level observation station information, etc. are registered into each layer independently, respectively. Vectors, such as a polygon (field) which shows a region of lines (line), such as a symbol (point) and a road, and an administration community of cities, towns and villages which show an institution and a disaster generating part, or an engineering-works office, are used for a layer. And two or more layers 1-3, for example, layers, are group-ized, and they are stored as the folder A. Two or more folders A and B and layers 6 and 7 are stored in a route folder, and are managed. this folder control mechanism twists a layer to a tree hierarchy structure -- hierarchy management can be carried out.

[0030]When displaying a map, information displayed on a map can be chosen for every scale of every map linkage function and a map by choosing a layer to display. Information stored in a selected layer is laid on top of a basic map (a topographical map or a road map), and a synthetic map is created. A display of a map of various combination is attained by this folder control mechanism. A layer which was specified for every scale and to display is managed as a default state, and it can reset to the state at any time.

[0031]A map search service determines and displays a display position and a display rectangle of a map to display an address of an attribute item, facility names (object name etc.), latitude, longitude, etc. on as a

search key. Specification of a search condition over an attribute item will display a map centering on a place applicable to a search condition. When there are two or more objects as a result of search, a map range containing them is displayed. When there are two or more search candidates, a search candidate is displayed in list form so that it can choose.

[0032]It has a function which registers data of data displayed on up to a map, for example, a symbol, a polygon, the poly line, etc., searches it with a function to manage, and displays this data. In order to register these map display data, a symbol defined beforehand is registered into the specified position, as a constituting point, in the case of a polygon, the starting point, a route, and an ending point are specified by mouse click one by one, and it draws and registers a multiple closed region into the specified position. As a constituting point of the poly line, in the case of the poly line, the starting point, a route, and an ending point are specified by mouse click one by one, and it draws and registers a part for a successive line. Display styles, such as a symbol, a polygon, and the poly line, are given for every every place figure linkage function.

[0033]In order to display the registered map display data, the display specification by the layer controlling function of a map data controlling function performs. An attribute item is expressed as blow off on a map, or a list screen. Search of map display data can be performed for data with the selected layer controlling function. This search is performed by specifying search conditions, such as range specification on a map, and layer specification. Circle area range specification etc. of the one-point specification by a mouse, the square area range specification by a mouse, the polygon range (closed region which specified three or more points and connected for two points to specified order in a straight line) specification by a mouse, and the central point and radius specification by a mouse are used for the range specification on a map.

[0034]Latitude and a longitude linkage function are functions which display the latitude and longitude of a position, and the kilo post for roads to which a mouse point points on real time according to a map display screen. Distance calculation and area calculation are performed in the Measurement Division function. Distance calculation connects for two points to the specified order in a straight line, and total of the distance, total of the distance of the existing poly line figure, the total extended distance of a road, etc. are found.

[0035]Next, the operation which acquires rainfall and water level information from the system 20 connected to the communication network 30 by the communication function of the courtesy counter 11, for example, a prevention-of-floods information system, and is displayed on a map by the map display function of the map engine part 13 is explained. Drawing 3 is a figure showing a flow until it takes rainfall and water level information for an example and displays on a map from acquisition of data. First, a user chooses "rainfall and a water level display" from the display data selection screen currently displayed on the display device (Step S101).

[0036]Map Engine control section 12 judges that it is necessary to read information related from the predetermined system 20 based on the display data selection signal inputted from the input device, and starts the communications program of the courtesy counter 11. And connection processing is performed to the system 20 connected to the communication network 30. The courtesy counter 11 checks that the communication line has been established, is accessed to the system 20, and reads the rainfall and water level information on all the observation offices (Step S102). Next, the position information on the observation

office of the rainfall and water level stored in the database 14 is read (Step S103).

[0037]So that the map figure decided based on the rainfall and water level information read at Step S102 and Step S103, and the position information on an observation office may be indicated by a screen on the position of each observation office, [ the courtesy counter 11 ] The map engine part 13 is called via map Engine control section 12 (Step S104). The map engine part 13 displays on a display device the map figure specified by the courtesy counter 11 (Step S105). The courtesy counter 11 processes Step S102 to the step S105 periodically with a predetermined time interval, obtains the updated data, and updates a screen display. When a user inputs the end of "rainfall and a water level display" from an input device, while ending a display, renewal of periodic data is finished.

[0038]Next, with reference to drawing 4, a flow of software preparing work of the geographic information system 10 is explained. First, service which a user demands is given with apparatus specification or software specification (Step S201). In Step S202, demand service is analyzed and a list of functions required in order to realize this service is created. This taken-up function is divided into a function relevant to a map engine, and a function irrelevant to a map engine. And specification of a function relevant to a map engine is sent to a group which creates map Engine control section 12.

[0039]Specification of a function irrelevant to a map engine is sent to a group which creates the courtesy counter 11. Here, in order to create a program by dividing into two, conditions of an interface of the courtesy counter 11 and map Engine control section 12 are set up. Conditions of an interface are set up according to general-purpose conditions so that a functional group divided into two can be developed separately. A group which creates map Engine control section 12 analyzes a necessary function (Step S203), and makes a GIS software maker create about a required program (Step S204).

[0040]On the other hand, the group which creates the courtesy counter 11 analyzes a necessary function (Step S205), and makes a software maker create a required program (Step S206). Since the special knowledge about a geographic information system is not needed for the program creation of the courtesy counter 11, arbitrary makers can be requested. Created joint processing of the courtesy counter 11 and map Engine control section 12 is performed (Step S207), and, finally the software of the geographic information system 10 is completed (Step S208).

[0041]The program which recorded on the recording medium which can computer read the program for realizing the function of the treating part in drawing 1, and was recorded on this recording medium may be made to read into computer systems, and map information processing may be performed by performing. Hardwares, such as OS and peripheral equipment, shall be included with "computer systems" here. If "computer systems" is the cases where the WWW system is used, they shall also include homepage offer environment (or display environment). "The recording medium in which computer reading is possible" means memory storage, such as a hard disk built in portable media, such as a floppy (registered trademark) disk, a magneto-optical disc, ROM, and CD-ROM, and computer systems. [ "recording medium / in which computer reading is" possible ] Like the volatile memory (RAM) inside the computer systems used as a server when a program is transmitted via communication lines, such as networks, such as the Internet, and a telephone line, or a client, the thing holding a definite-period-of-time program shall also be included.

[0042]The above-mentioned program may be transmitted to other computer systems via a transmission

medium from the computer systems which stored this program in memory storage etc. by the transmitted wave in a transmission medium. Here, the "transmission medium" which transmits a program says the thing of a medium which has the function to transmit information like communication lines (communication line), such as networks (communications network), such as the Internet, and a telephone line. The above-mentioned program may be for realizing a part of function mentioned above. They may be what can realize the function mentioned above in combination with the program already recorded on computer systems, and what is called a patch file (difference program).

[0043]

[Effect of the Invention] Since a function is divided into the portion corresponding to the service which the map engine which is a basic motion portion of a geographic information system, and a user demand according to this invention as explained above, It becomes possible to develop each portion separately, a development period is shortened, and the effect that the development cost of the whole system can be reduced is acquired. Since each portion can be developed separately, the development engineer should have only the technical knowledge of each portion, it becomes easy to secure an engineer and the effect that development of a big system also becomes easy is acquired. Since various users' demand can be satisfied by changing only a service portion, the use of a geographic information system can be spread further.

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[Brief Description of the Drawings]

[Drawing 1] It is a figure showing the software configuration of one embodiment of this invention.

[Drawing 2] It is a figure showing hierarchy management of map data.

[Drawing 3] It is a figure showing the flow which displays rainfall and water level information on a map.

[Drawing 4] It is a figure showing the flow of software creation.

[Drawing 5] It is a figure showing the software configuration of the conventional geographic information system.

[Explanations of letters or numerals]

10 Geographic information system (GIS) software

11 Courtesy counter

12 Map Engine control section

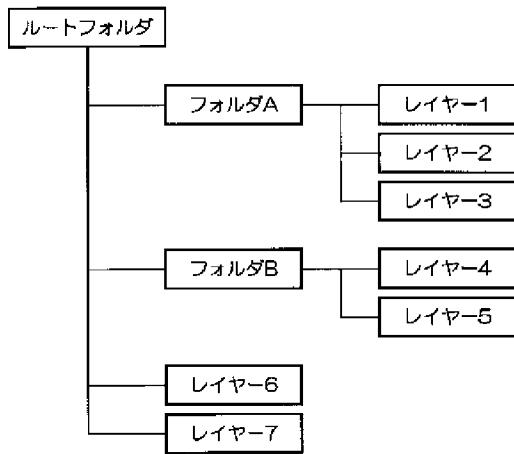
13 Map engine part

14 Database

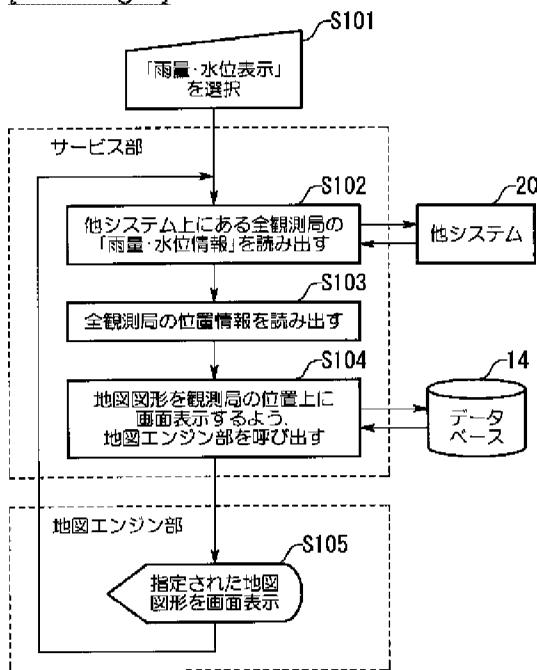
15a-15c Database

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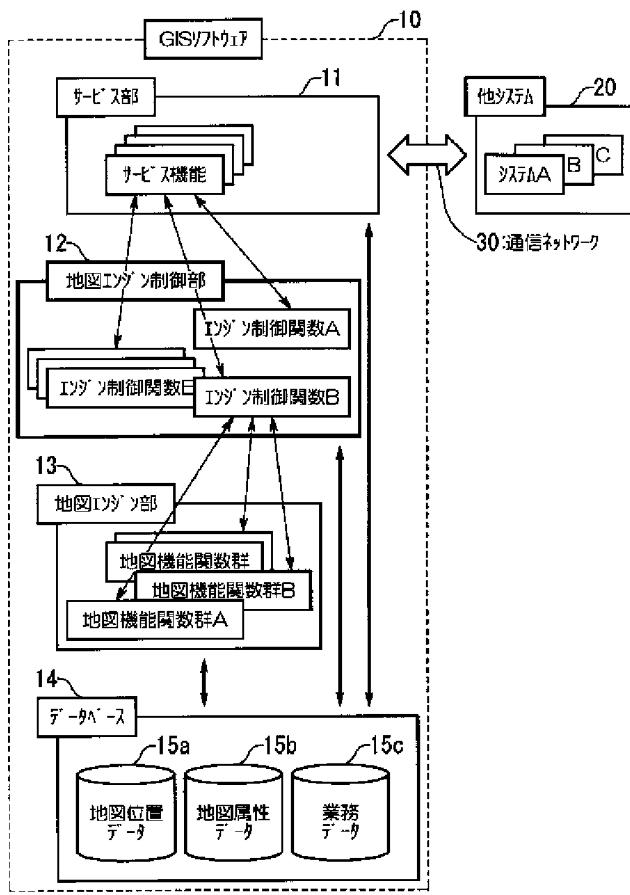
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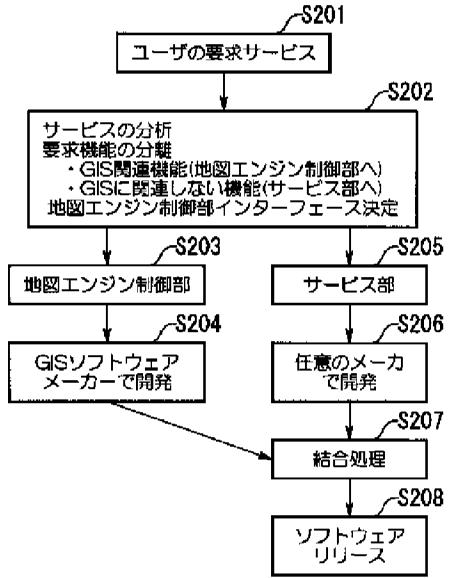
[Drawing 3]



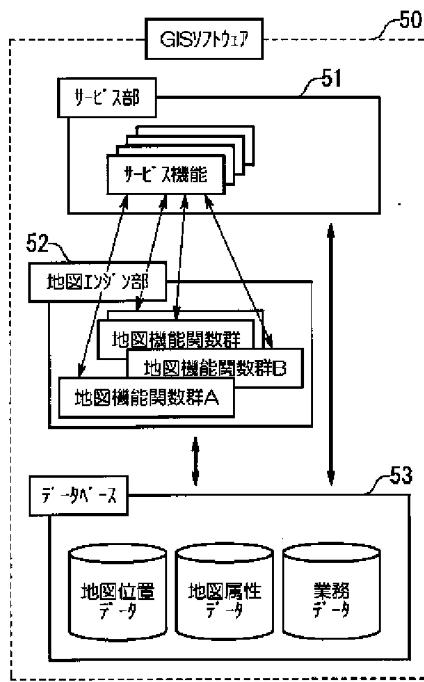
[Drawing 1]



[Drawing 4]



[Drawing 5]



[Translation done.]